

NON SI UNITS						
Proportions for Bituminous Surface Treatment						
			Cover Material		Bituminous Material	
Type	Application	Aggregate Size No.	Cubic Feet of Stone per Square Yard	Cubic Feet of Slag per Square Yard	Gallons of Asphalt Cement per Square Yard	Gallons of Emulsified Asphalt per Square Yard
1-A		56	0.42-0.46	0.45-0.52	0.30-0.45	0.36-0.54
1-B		6	0.32-0.38	0.35-0.42	0.20-0.30	0.24-0.36
*1-B		6	0.34	0.38	0.30	0.33
2	1st	56	0.42-0.46	0.46-0.52	0.18-0.22	0.22-0.26
	2nd	7	0.18-0.24	0.22-0.26	0.26-0.31	0.31-0.37
3	1st	56	0.42-0.46	0.46-0.52	0.18-0.22	0.22-0.26
	2nd	7	0.18-0.24	0.22-0.26	0.25-0.29	0.30-0.35
	3rd	89	0.10-0.16	0.10-0.16	0.18-0.22	0.22-0.26

*For use in conjunction with Asphaltic Concrete.

SI UNITS						
Proportions for Bituminous Surface Treatment						
Type	Application	Aggregate Size No.	Cover Material		Bituminous Material	
			Cubic Meter of Stone per Square Meter	Cubic Meter of Slag per Square Meter	Liters of Asphalt Cement per Square Meter	Liters of Emulsified Asphalt per Square Meter
1-A		56	0.014-0.016	0.015-0.018	1.4 - 2.0	1.6 - 2.4
1-B		6	0.011-0.013	0.012-0.014	0.9 - 1.4	1.1 - 1.6
*1-B		6	0.012	0.013	1.4	1.5
2	1st	56	0.014-0.016	0.016-0.018	0.8 - 1.0	1.0 - 1.2
	2nd	7	0.006-0.008	0.008-0.009	1.2 - 1.4	1.4 - 1.7
3	1st	56	0.014-0.016	0.016-0.018	0.8 - 1.0	1.0 - 1.2
	2nd	7	0.006-0.008	0.008-0.009	1.1 - 1.3	1.4 - 1.6
	3rd	89	0.003-0.005	0.003-.005	0.8 - 1.0	1.0 - 1.2
*For use in conjunction with Asphaltic Concrete.						

(The Engineer will also allow cut-back asphalt, in the same proportions as shown for Asphalt Cement.)

NON SI UNITS			
Proportions for Mineral Seal Coat			
Cover Material		Bituminous Material	
Aggregate Size No.	Cubic Feet per Square Yard	Gallons of AC or RC per Square Yard	Gallons of Emulsified Asphalt per Square Yard
6	0.32 - 0.38	0.22 - 0.35	0.25 - 0.40
7	0.18 - 0.26	0.15 - 0.22	0.17 - 0.25
**89	0.13 - 0.18	0.12 - 0.18	0.14 - 0.23
** Use Size No. 89 unless other grade is specifically specified.			

SI UNITS			
Proportions for Mineral Seal Coat			
Cover Material		Bituminous Material	
Aggregate Size No.	Cubic Meters per Square Meter	Liters of AC or RC per Square Meter	Liters of Emulsified Asphalt per Square Meter
6	0.011 - 0.013	1.0 - 1.6	1.1 - 1.8
7	0.006 - 0.009	0.7 - 1.0	0.8 - 1.1
**89	0.004 - 0.006	0.5 - 0.8	0.6 - 1.0
**Use Size No. 89 unless other grade is specifically specified.			

310-3 Materials.

310-3.1 General Materials: Meet the following requirements:

(1) Bituminous Material:

Asphalt Cement, Viscosity Grade AC-5	916-1
Asphalt Cement, Viscosity Grade AC-10	916-1
Cut-back Asphalt, Grade RC-3000	916-3
Emulsified Asphalt, Grade CRS-2 and CRS-2H	916-4
Emulsified Asphalt, Grade RS-2.....	916-4

(2) Cover Material, limestone, slag or granite Section 901

310-3.2 Alternate Bituminous Materials Shown in Proposal: Except for surface treatment used in conjunction with asphaltic concrete, the proposal will call for the use of either asphalt cement or emulsified asphalt as the bituminous material. If asphalt cement is stipulated in the Contractor's bid, the Engineer will restrict its actual use by seasonal requirements as provided in 310-3.4.

310-3.3 Optional Bituminous Materials for Surface Treatment Used in Conjunction with Asphaltic Concrete: For surface treatment used in conjunction with asphaltic concrete, the alternate items will not be shown, and the Contractor may choose the type to use, except as limited below for seasonal requirements.

310-3.4 Seasonal Requirements: For the asphalt cement alternate or option, in the event that the surface treatment or mineral seal coat is to be applied during the months of November through April, use cut-back asphalt or emulsified asphalt, Grade RS-2 or CRS-2, instead. During the remaining months of the year, the Contractor may use cut-back asphalt or emulsified asphalt in lieu of asphalt cement. When the Contractor uses emulsified asphalt and the Contractor based his bid on the use of asphalt cement, the Department will reduce the Contract unit price for bituminous material used in bituminous surface treatment or mineral seal coat by 10%.

310-3.5 Alternate Use of Aggregates: Unless first obtaining written permission from the Engineer, do not use coarse aggregates of different color in sections less than 1 mile [1.5 km] in length.

310-4 Equipment.

310-4.1 Pressure Distributor: Provide a pressure distributor that meets the requirements of 300-3.1.

310-4.2 Spreading Equipment: Provide sufficient trucks and aggregate spreaders at the site of the work to ensure continuous spreading of the aggregate on the uncovered bituminous material. Use a spreader of the mechanical type that is self-supported (towed) or self-propelled and is capable of producing a smooth, uniform distribution of the cover material. Do not use spreaders of the type attached directly to the rear of the truck body (tail gate spreaders).

310-4.3 Rollers: Provide rollers that are 3 to 5 ton [2.7 to 4.5 metric ton] steel-tired, or combination steel and rubber-tired, rollers and self-propelled, pneumatic-tired traffic type rollers equipped with at least seven smooth-tread, low-pressure tires and capable of carrying a gross load of at least 8 tons [7 metric tons]. Maintain the inflation of the tires such that in no two tires the air pressure varies more than 5 psi [35 kPa]. Load the traffic roller as directed by the Engineer.

310-5 Limitations to Width of Application.

Apply bituminous and cover materials over the entire width to be treated unless, in the opinion of the Engineer, traffic conditions are not suitable for full-width application. If traffic conditions are not suitable for full-width application, confine the application to one side of the road at one time over such area as the economical distribution of material from one delivery point will permit, leaving the other side open for traffic.

310-6 Preparation of Road Surface.

310-6.1 Cleaning: Sweep the surface to be covered clean and free of sand, dirt, dust, and other deleterious material by means of mechanical rotary sweepers, hand brooms, or other approved methods, and keep the surface free from moisture.

310-6.2 Condition of Underlying Surface: Where a prime coat has previously been applied to the surface, do not apply bituminous material until the prime coat has become thoroughly cured, as determined by the Engineer. Do not apply surface treatment over any pavement mixture when, due to heat from the sun or insufficient length of the curing period, the stability of the existing pavement is such as to allow penetration or displacement of the existing surface by the cover material during the rolling operations.

310-7 Protection of Adjacent Surfaces.

Where applying these surface courses adjacent to curb and gutter, valley gutter, or any other concrete surface, cover the concrete surfaces with heavy paper or other protection as approved by the Engineer during application of the bituminous material. Immediately remove any bituminous material deposited on such concrete surfaces.

310-8 Weather Limitations.

Do not apply bituminous material when the air temperature in the shade and away from artificial heat is less than 60°F [15°C] at the location where application is to be made, or when weather conditions or the surface conditions are otherwise unfavorable.

310-9 Application of Bituminous Material.

310-9.1 Distributor Pressure: After cleaning the surface to be treated to the satisfaction of the Engineer, uniformly spray the bituminous material over the surface by means of a pressure distributor. When a surface constructed under this Section is on a paved shoulder, use a stringline or other approved method to produce a uniform line along the edge of the applied bituminous material adjacent to the traffic lanes. Use a distributor that maintains a pressure of at least 20 psi [140 kPa], but not more than 75 psi [520 kPa].

310-9.2 Application Temperatures: For asphalt cement, maintain an application temperature between 300 and 350°F [150 and 175°C]. For emulsified asphalt, maintain an application temperature between 100 and 170°F [38 and 75°C]. For cut-back asphalt, maintain an application temperature between 175 and 275°F [80 and 135°C].

310-9.3 Uniformity of Distribution: Take special precautions to obtain an even and uniform distribution of bituminous material, and adjust and operate the distributor so as to maintain uniform, even distribution of the type of material being applied. Immediately remove excessive deposits of bituminous material upon the road surface caused by stopping or starting the distributor, by leakage, or otherwise.

310-9.4 Limitations to Application: Ensure that the area to be covered by any one application of bituminous material is not greater than the aggregate can cover without interruption due to limitations of hauling and spreading equipment or to any other cause.

For double and triple application surface treatments, apply the second and third applications of bituminous and cover materials the same day as the first application, as far as is practicable and consistent with the curing requirements as specified in 310-11.

310-10 Spreading Cover Material.

310-10.1 Spreading: Spread the cover material immediately following each application of bituminous material. Uniformly distribute the cover material over the bituminous surface in one, two, or three courses, as specified. Perform spreading using approved mechanical spreaders. Use only drivers experienced in this type of work for driving the spreaders (or trucks when using towed spreaders). Do not drive trucks or spreaders on the uncovered bituminous material.

310-10.2 Double Application: For double application, distribute the cover material alternately over the bituminous surface in two separate courses. Apply the coarse size immediately after the first application of bituminous material, and uniformly distribute an amount that will cover the surface completely with a single layer of material. Broom the first application as needed to obtain a uniform surface, ensuring that no piece of cover material rests on top of another, and then roll it. After rolling and curing the first application as specified in 310-11, apply the second application of bituminous material, and immediately thereafter distribute the fine size cover material uniformly over the surface in the quantity specified or in an amount that completely fills the voids of the first application. Then, broom the fine size cover material as needed to secure a smooth and uniform surface, and roll it as specified in 310-11.

310-10.3 Triple Application: For triple application surface treatment, apply the cover material in three applications in the proportions specified. Spread, broom, and roll the first and second applications of bituminous and cover materials as provided in this Subarticle for double application surface treatment. Then, spread, broom, and roll the third application of bituminous and cover material as provided for the second application.

310-10.4 Brooming and Dressing: Immediately after each application of cover material, broom the surface in order to secure a uniform distribution of cover material and a smooth surface. Place additional aggregate by hand on any areas not properly covered. If deemed necessary by the Engineer, drag the surface with a light drag broom or other dragging equipment approved by the Engineer, of a type that will not disturb the embedded aggregate. Supplement this operation by additional hand brooming until obtaining a smooth and even surface. Repeat the dragging and brooming in conjunction with the rolling for as long as required to ensure a uniform surface. Apply these dragging requirements for each application of cover material.

310-11 Rolling and Curing.

310-11.1 General Requirements: Immediately after the spreading and dragging of each application of cover material, roll the entire surface. Begin the rolling within 30 minutes after the spreading of cover material. Begin rolling at the edges and progress to the center of the surface, uniformly lapping each preceding pass and thoroughly covering the entire surface. During rolling, perform additional dragging and hand brooming as specified in 310-10.5.

First, roll the entire surface with a traffic roller, followed immediately with a steel-wheeled roller. Cover the entire surface one time with the steel-wheeled roller. Then, roll the cover material again with the traffic roller.

Continue the rolling as long as is necessary to ensure thorough keying of the cover material into the bituminous material and to secure a uniformly closed surface.

310-11.2 Omission of Steel-Tired Roller: On stabilized bases or where the surface to be covered is irregular, the Contractor may omit rolling with the steel-tired roller, if so directed by the Engineer.

310-11.3 Shoulder Pavement: For bituminous surface treated shoulder pavement, the Engineer may require additional rolling as he deems necessary in order to compensate for the lack of subsequent rolling by highway traffic.

310-11.4 Curing Surface Treatment Used in Conjunction with Asphaltic Concrete: When covering the surface treatment with an asphaltic concrete course, thoroughly cure the surface treatment for a period of at least 30 days prior to applying the overlying course. When constructing the roadway under traffic, or otherwise wherever feasible to route traffic over the section, place traffic on the surface treatment for this 30-day curing period. In the event the Engineer considers that such traffic is sufficient to effect the required curing of the surface treatment in less than 30 days, he may shorten this 30-day period and notify the Contractor, in writing, that the surface treatment is cured sufficiently for placing the asphaltic concrete.

310-12 Surface Requirements.

Provide a finished surface that is uniform and conforms to the lines, grades, and typical cross-section shown in the plans. Remove all portions of the completed surface that are defective, are not properly finished, have fat joints, or are not in reasonably close conformance with these Specifications, and replace them with a satisfactory surface. The Department will not pay for the defective work and its removal.

When placing an asphaltic concrete course over the surface treatment, remove, or otherwise correct, any joint showing an excess of bituminous material before placing the overlying surface course.

310-13 Protection.

After applying the bituminous material, do not allow traffic to use the road until placing and thoroughly rolling the cover material. If practicable, keep traffic off the finished surface for the first 48 hours after completing finishing. Where it is impracticable to keep traffic off the finished surface for such period, restrict traffic to a maximum speed of 15 mph [25 km/h] during this time. For this purpose, furnish and maintain suitable barricades and lights, and provide watchmen and vehicles to lead traffic through the sections of the roadway being protected. Keep at least two such watchmen on duty continuously during this 48-hour restricted period, and provide a sufficient number to ensure enforcement of the 15 mph [25 km/h] maximum speed.

310-14 Method of Measurement.

310-14.1 Bituminous Material: The quantity to be paid for will be the volume, in gallons [liters], applied on the road and accepted, determined as provided in 300-8.

310-14.2 Cover Material: The quantity to be paid for will be the volume, in cubic yards [cubic meters], applied on the road and accepted, determined by measurement, in loose volume, in truck bodies for the particular type of surface treatment or for mineral seal coat.

310-14.3 Surface Treatment Placed with Asphaltic Concrete: As an exception to the above, when the Contractor places the surface treatment in conjunction with asphaltic concrete, compensation for surface treatment will be included in the payment for the asphaltic concrete course.

310-15 Basis of Payment.

310-15.1 Bituminous Material: Price and payment will be full compensation for furnishing all the materials and for heating, hauling, and applying.

310-15.2 Deduction for Deficiency in Viscosity or Deficiency from Minimum Percent Residue Required: The Contract unit price for Bituminous Material will be subject to the pay reduction tables contained in Section 916.

310-15.3 Cover Material: Price and payment will be full compensation for all the work described in this Section, except for the work paid for under the item of Bituminous Material.

310-15.4 Payment Items: Payment will be made under:

Item No. 300-	1-	Bituminous Material - per gallon.
Item No. 2300-	1-	Bituminous Material - per liter.
Item No. 310-	1-	Cover Material for Single Surface Treatment - per cubic yard.
Item No. 2310-	1-	Cover Material for Single Surface Treatment - per cubic meter.
Item No. 310-	2-	Cover Material for Type 2 Surface Treatment - per cubic yard.
Item No. 2310-	2-	Cover Material for Type 2 Surface Treatment - per cubic meter.
Item No. 310-	3-	Cover Material for Type 3 Surface Treatment - per cubic yard.
Item No. 2310-	3-	Cover Material for Type 3 Surface Treatment - per cubic meter.
Item No. 310-	4-	Cover Material for Mineral Seal Coat - per cubic yard.
Item No. 2310-	4-	Cover Material for Mineral Seal Coat - per cubic meter.